DOCUMENT RESUME

ED 122 226 CS 002 582

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TITLE The Effect of Signal Words on Comprehension.
PUB DATE 76
NOTE 19p.; Paper presented at the Annual Meeting of the International Reading Association (21st, Anaheim, California, May 1976); Reproduced from best copy available

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS College Students; *Function Words; Junior Colleges; *Reading Comprehension; *Reading Instruction; Reading Research; *Sentence Structure; *Vocabulary Development

ABSTRACT

This study investigated the effect of signal words on the comprehension of 103 first year community college students. The signal words studied were cause and effect, comparison-contrast, chronological, and enumerative words. A 40 paragraph comprehension test consisting of five different paragraphs for each of eight signal words and a test consisting of an alternate version of each paragraph with signal words omitted were used. The subjects were divided, and each half read one version of the comprehension passages and answered multiple choice questions after the reading. The major finding was that a statistically significant difference exists in the comprehension of college students who read paragraphs with signal words. High academic achievers performed better than low academic achievers on passages containing signal words. The groups of high and low achievers responded similarly to paragraphs without signal words. The findings may have relevance for the teaching of signal words as aids to understanding speech and writing and for including such aids to comprehension in written passages, specifically textbooks. (MKM)

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The Effect of Signal Words on Comprehension

Paper Presented at the
International Reading Association Conference
Thursday, May 13, 1976
Anaheim, California

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CS 002 582

Many recommendations have been made to teachers concerning the importance of teaching various comprehension skills. Yet, there is little agreement on the relative importance of these skills. As a result, the teaching of techniques recommended to increase one's comprehension proceed on a trial and error basis. One recommendation often found in reading skills textbooks, manuals, and English logic and rhetoric textbooks at the secondary and college level is to teach signal words. There is theoretical but not empirical agreement among these disciplines that signal words help students comprehend what is read. Which ones to teach and how to teach them varies considerably. Each discipline approaches the concept of signal words differently. Even authors within a particular discipline do not agree on terminology or definition. Synthesis of theories and application is necessary so that classroom teachers can make appropriate decisions about teaching signal words.

The purpose of this study was to measure the influence of signal words on comprehension. Would paragraphs with signal words be better understood than paragraphs without signal words? Would some signal words be more important than others? If differences exist, would they be the same for good as well as for poor students?

Throughout the literature, the knowledge and use of signal words are recognized as one way to improve comprehension. Signal words are non-content key words in a sentence or paragraph that help the reader

understand what is read. These words are transitional devices that link ideas expressed between clauses in sentences, between sentences in a paragraph and between paragraphs in expository writing. Writers use signal words to refer to what has happened, to what is going to happen, and depending upon where placed, are key pivotal words for clarifying ideas in a sentence or paragraph. The reader's ability to recognize this relationship depends upon the writer's appropriate selection of signal words.

Other terms used synonomously with signal words are: connective, signaling, signals, linkage, explaining links, transitional or pivotal words. Which term is used often depends upon the discipline--whether it is reading, speech, English, linguistics, or psychology.

Specific signal words serve special purposes in sentences. Some signal words indicate a change in direction of thought, such as; although, in contrast, however, and yet. Some words indicate a flow of ideas one after the other: first, second, next, and finally. Some reveal a time sequence: before, after, formerly, and presently. Some indicate cause and effect: therefore, as a result, for this reason.

Three authors who have summarized particular categories of signal words are Pauk (1974), Vacca (1973), and Dechant (1973). Figure 1 shows four categories and words each author has assigned to the various categories.

Figure 1

Signal Words

CAUSE-EFFECT	COMPARISON-CONTRAST	CHRONOLOGICAL	ENUMERATIVE
therefore	but	on (date)	to begin with
accordingly	however	not long after	first
it follows	on the other hand	now	secondly
thus	+in comparison	as	next
as a result	although	before	then
hence	=conversely	after	finally
in conclusion	yet	=afterwards	=second
=for this reason	+rather	=later	
=because	+still	=formerly	
nevertheless	+in spite of	=meanwhile	
	+nevertheless	=presently	
	+on the contrary	=previously	
	+notwithstanding	=subsequently	
	+at the same time	=ultimately	
	+despite		
	either..or		
	not only..but also		
	while		
	unless		
	as well as		

KEY: = Pauk (1974, p. 116)
Vacca (1973, p. 78)

\+ Dechant (1973, pp. 259, 260)

Looking at this from a linguist point of view, Grimes (in press) believes that a speaker/writer focuses or highlights certain parts of the message, and defocuses other parts. Grimes calls this staging. One way a speaker/writer might do this is by using implied or explicit signals to coordinate a topic. Explicit signals are words such as and, but, however, therefore. A coordinating signal is implied if the new topic is an answer to a previous question, if it contrasts an earlier topic, or if it is anticipated by an earlier topic. Grimes proposes that it is possible to map out a passage using his staging levels.

Review of the Literature

Previous studies indicate that there may be a correlation between a student's grade level and the understanding of specific signal words (connectives). Robertson (1968) found a significant increase from 4th to 6th grade in students' understanding of connectives (signal words). Connectives that caused comprehension difficulty were although, which, and yet. Sentence linkers (words that have no function as nouns or adjectives: however and thus) caused more comprehension difficulty than any others. Rodgers (1974) examined first grade children's understanding of twenty connectives (signal words) that linked ideas. Two-thirds of the children did not know in spite of, yet, for used as because, although, nevertheless, still, thus, and however. About half knew although, consequently, unfortunately, even if, and because. Because and although were more difficult at the beginning of a sentence. Rodgers then examined 35 textbooks from sixth through twelfth grade. Sixteen connectives each used 1000 or more times were: but, if, because, when, however, as, although, thus, then, while, for example, since, also, therefore, so, and even. Furthermore appeared 250-499 times, and in contrast appeared 100-249 times.

Meyer (1974) investigating factors influencing prose recall (passages with and without signal words) found that college students were able to recall information placed at the beginning of passages whether signal words were present or absent; that when signal words were deleted from passages, subjects tended to include them in their recall; and signal words occurring in the middle of passages increased recall. She found that enumeration as a signaling device improved recall but if too many signal words were used it reduced students' understanding.

Hypothesis

This study investigated the influence signal words have on comprehension. It was proposed that selections with signal words would be better understood than the same selections without signal words. Some signal words would have more influence than others. Furthermore, signal words might be more useful to certain kinds of readers. High achieving students' comprehension might be less affected by the deletion of signal words than low achievers. But both good and poor readers would profit from paragraphs utilizing signal words.

Procedures

The study concentrates on the moderately skilled reader--the college student--on the assumption that what can be done by the college student tells what the younger student has to learn to do. In addition results should be useful to teachers concerned with the successful achieving student in college as well as less successful low achieving students.

One hundred and ~~sixteen~~ three first year students enrolled in two New York State two-year colleges volunteered to participate in the study. One was a community college with a strong liberal arts orientation, and the other a state agricultural and technical college emphasizing technical training.

Paragraphs from the Senior Reading for Understanding Program (Science Research Associates) were selected that contained signal words. Paragraphs with the same signal words were grouped together. Eight signal words were found to occur with high frequenty throughout the paragraphs in the program: although, however, in contrast, thus, because,

therefore, furthermore, and for this reason. The instrument consisted of five different paragraphs for each of eight signal words--a total of 40 paragraphs. Sequence depended upon the order in which each set of paragraphs occurred in the Program.

A modified version of each paragraph was prepared which omitted signal words. In the process of deleting these signal words, if the word occurred at the beginning of a sentence it did not seem to alter the meaning to any significant degree. The original meaning was also retained when two sentences were formed from the one by adding a subject and/or a verb to the second portion of the sentence. However, when the deletion occurred in other places, a change in meaning was likely.

In the Program, questions are provided to assess the comprehension of each paragraph. A modified cloze technique is used in which the last sentence of the paragraph leads into four multiple-choice answers. The reader selects the best answer. Figure 2 shows one of the paragraphs containing signal words and modifications made in the same paragraph by deleting signal words.

Figure 2

Original Paragraph	Modified Paragraph
Birds, which developed relatively late in the geologic time scale, had certain advantages over the fish and reptiles of an earlier age. As compared with scales, feathers provided a warm covering that helped the bird maintain a temperature that is today higher than that of any other animal. Furthermore, feathers are lighter than scales, and the bird could fly over a wide area in search of food and away from its enemies. A principal factor in lifting birdlife above its reptilian origin was	Birds, which developed relatively late in the geologic time scale, had certain advantages over the fish and reptiles of an earlier age. As compared with scales, feathers provided a warm covering that helped the bird maintain a temperature that is today higher than that of any other animal. Feathers are lighter than scales, and the bird could fly over a wide area in search of food and away from its enemies. A principal factor in lifting birdlife above its reptilian origin was
A--lightness B--feathers C--warmth D--speed	A--lightness B--feathers C--warmth D--speed

The signal word furthermore emphasizes the value of birds' feathers and provides the reader with a clue to the most important factor in the paragraph. Without it readers may find it necessary to reread the passage to make sure feathers is the appropriate answer.

The paragraphs, arranged in sequential order, were printed on 8 by 11½ inch sheets typed on one side only. This sequential order was repeated five times, making a total of 40 paragraphs. Paragraphs without signal words were placed in red folders. Paragraphs with signal words were placed in assorted colored folders. In addition a page of directions based on procedures commonly used for giving standardized reading survey tests and an answer sheet were included in each packet.

Subjects from each school reported to class and took any seat they wished. Folders were handed out one by one to students as they were seated. By prearranging the folders in alternating order, the number of students having passages with and passages without signal words was kept equal in each school. Students read the paragraphs and selected the best answer. Comprehension scores were based on the total number of correct answers given for the 40 paragraphs.

Analysis of Findings

The statistical technique employed was analysis of variance by means of regression analysis. Regression analysis was used to test whether there was linear relation of grade point average to the total comprehension score. Student grade point averages varied from 1.7 to 4.0. Also tested was the difference between the comprehension scores of students in paragraphs with and without signal words, and whether there was a difference among the eight signal words. Duncan's New Multiple Range Test was used to determine differences among the eight signal words. Information for high achievers (grade point average 3.0+) and low achievers (grade point average below 1.9) was obtained from a two-way analysis of variance.

The major finding was that statistically significant differences exist ($p < .01$) in the comprehension scores of students who read paragraphs with signal words compared to paragraphs without signal words. There was a variation significant beyond the .001 level among the eight signal words. This is shown in Table 1.

Table 1

Analysis of Variance Table
Regression Coefficients and Statistics of Fit for Dependent Variable Response 40

Source	DF	Sum of Squares	Partial SS	Mean Square	F Value	Prob < F
Regression	33	103.25523091		3.12894639	2.23956	0.0002***
1 Grade Point	1		0.36081001		0.25825	0.6115
2 Grade Square	1		0.00168923		0.00121	0.9723
3 College	1		6.68087187		4.78188	0.0292*
4 Signal (W/WO)	1		10.35438165		7.41122	0.0067**
5 Word (8 signal words)	7		37.02382078		3.78572	0.0007***
Error	574	801.94871646		1.39712320		
Correct Total	607	905.20394737				

* 0.05 Level of significance
** 0.01 Level of significance
*** 0.001 Level of significance

The mean scores of the signal words when rank ordered formed two groups. One group of words, in contrast, because, although, therefore, for this reason, thus, furthermore, were not significantly different from one another. The second group overlapped the first group and consisted of therefore, for this reason, thus, furthermore, and however. These signal words were not significantly different from one another. As can be seen in Table 2 one signal word was more influential than the others--however, $\bar{x}$ = 2.60330. However is significantly different from in contrast, $\bar{x}$ = 3.26120, because, $\bar{x}$ = 3.20860, and although, $\bar{x}$ = 3.18230. These results show that two-year college students' comprehension scores were affected to a greater degree when the signal word however was deleted from paragraphs.

Table 2

Test on the Means of Eight Signal Words

Signal Word	Rank Order	Group 1	Group 2	Mean Scores (Range 0-5)
In contrast	1		†	3.26120
Because	2			3.20860
Although	3			3.18230
Therefore	4	†		2.91910
For this reason	5			2.91910
Thus	6			2.84020
Furthermore	7		†	2.78750
However	8	†		2.60330

Both high and low grade point average students respond better to comprehension tasks when signal words are included in paragraphs. As was expected, high achievers scored higher on paragraphs with signal

words than low achievers. High achieving students may be able to use information in passages to the fullest extent whereas low achieving students may need to be taught how to use this information. Of interest are the responses of both populations to paragraphs without signal words. It was almost the same: low achievers $\overline{X} = 25.00$; high achievers $\overline{X} = 25.82$. It was expected that high achievers would not be affected as much by deletion of signal words. Mean scores have been plotted on the graph shown in Figure 3, page 13.

Discussion

This study does substantiate the importance of signal words in aiding comprehension. When signal words are available in expository material, students at two-year colleges achieve higher comprehension scores. This is of great importance to publishers of secondary and college textbooks. In recent years many study techniques have been introduced in textbooks: previews of new vocabulary words, advanced organizers such as headings, subheadings, various pre and post questioning devices, summaries as well as ways to apply information learned.

Nevertheless Peters (1975-1976) and Lee and Anderson (1970) suggest that procedures used by textbook writers to present concepts are still inadequate. In a study by Peters comparing the use of the Frayer model versus the usual textbook approach, good and poor readers achieved a 25 per cent higher mean score on comprehension using the former model. Good readers were less affected by the organization of written material.

Figure 3
Comprehension Scores of Low and High Achievers
(With and Without Signal Words)

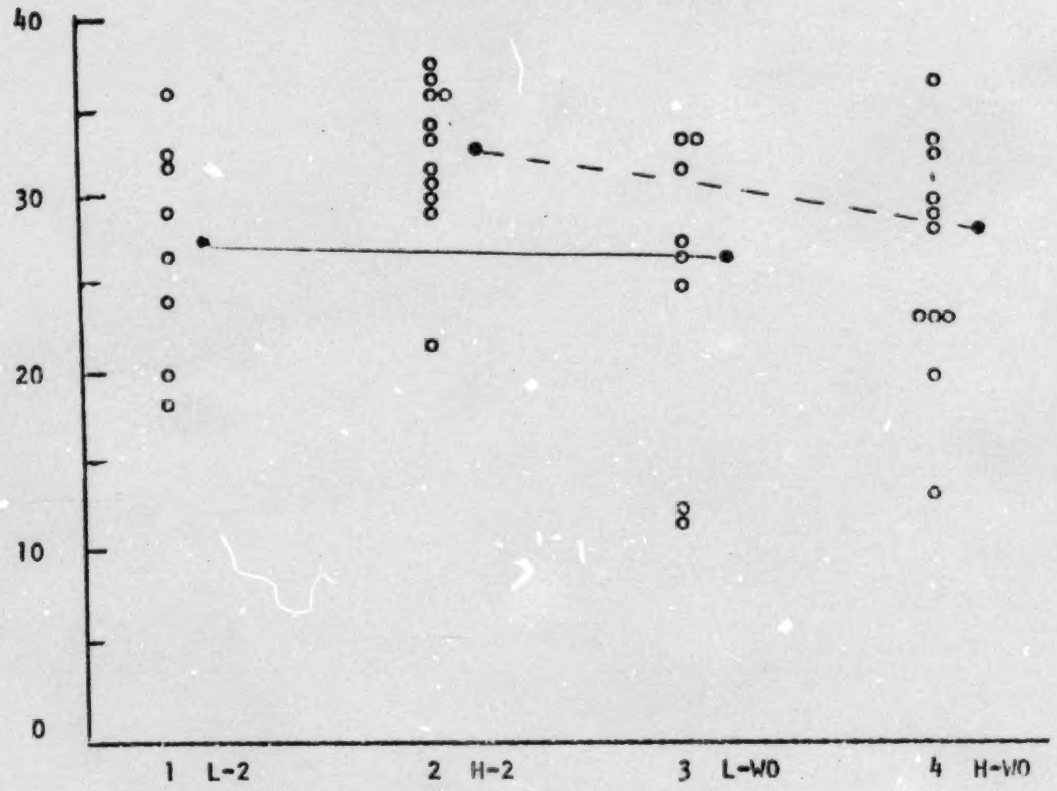

Figure 3. Comprehension scores of low (L) and high (H) achievers with (W) and without (WO) paragraph signal word on ordinate as function of Groups 1-4 on abscissa. Individual scores are indicated by open circles and mean ± s.e.m. by filled circles.

Group 1. L-W - 27.25 ± 1.97; n=8. Group 2. H-W - 31.91 ± 1.26; n=11.

Group 3. L-WO - 25.00 ± 2.64; n=8. Group 4. H-WO - 25.82 ± 1.78; n=11.

KEY: – – – – – High Achievers

——————— Low Achievers

The present study indicates an additional factor which aids students' understanding of a textbook--the inclusion of signal words. These words enable the reader to recognize the relationship of ideas presented by the author. Even very successful students' comprehension is affected when these signposts are eliminated. Therefore, this study has implications for textbook writers and publishers. Future textbooks should be scrutinized more carefully for the authors' inclusion of appropriate signal words. It is as important a feature as an addition of study techniques such as headings, subheadings, and so on.

Curriculum planners for schools might assume from this study that the teaching of signal words should be included in the instructional plans for secondary and college classroom teachers. Knowledge of these words, how they act as signposts to alert the reader to what has happened, to what is going to happen should increase students' ability to be selective in retaining information from textbooks. For the low achieving student, it may make the difference between unclear, disorganized learning and well-organized, selective learning. In addition, classroom teachers may find the inclusion of appropriate signal words in teacher developed classroom materials an aid to students' comprehension.

Similar implications are possible for composition, the analysis of literature, the study of foreign languages and oral communication. Recent research by Rosenshine (1968) indicates that one of three reliable variables that discriminate teachers whose pupils score high on achievement tests was their use of explaining links (because, in order to, if,

consequently). The effective teacher used these links more times per lecture, per minute, and per 100 words. Therefore, skill in recognizing a speaker's use of signal words may also increase the listeners' understanding.

Further Research

Because there appears to be a correlation between grade level and understanding of signal words (connectives), this study should be replicated using appropriate passages with intermediate, junior high and secondary students. At various grade levels more pronounced differences in students' comprehension may exist in paragraphs with and without signal words. Other areas to investigate are the effect on comprehension of the position of signal words in paragraphs and the use of different types of paragraphs.

Limitations

Results should be interpreted in view of the following: the definition of high and low achievers was arbitrarily based on students' grade point average rather than IQ scores, achievement scores, or reading test scores. For this study only grade point averages were available.

Other factors within the paragraphs may have influenced students' comprehension when the signal words were deleted from the paragraphs. Analysis of the structure of the paragraphs might reveal additional elements affecting comprehension. At this time techniques for analyzing the organizational structure are not well enough defined and tested. Researchers analyses of the structure of prose are not identical and

vary on different dimensions. Therefore the structure of the paragraphs used in the study were not analyzed except for the presence or absence of specific signal words and their location in the paragraphs.

Finally, observation of the results from the two colleges show that students from the community college with a liberal arts orientation performed better on the comprehension task. It is possible that their reading, and writing skills are more highly developed. Therefore, their ability to use signal words may be better. Results may have been quite different if two similar colleges had participated in the study.

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